

Year 2000 Compliancy

Critical System Test Plans: Current Data Processing

Thomas D. Bethem and Peter Stone

Silver Spring, Maryland
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noaa National Oceanic And Atmospheric Administration

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1.1 Current Data Processing

Summary:

- C In their presently used form, none of the software had problems handling or manipulating dates and time. All software is deemed compliant with Y2K requirements.
- C All Silicon Graphics workstations are running IRIX version 6.5 which is compliant.
- C All Silicon Graphic workstation hardware is compliant.

1.1.1 Software and Firmware compliancy

1.1.1.1 Commercial Off the Shelf (COTS) Application Software

- C IDL (Interactive Data Language) - Compliant Documentation On File
- C XMSG - shareware (Version 4.1.2) - Compliant Documentation On File

1.1.1.2 Operating Systems and BIOS

All post-processing of current meter data is done on the Silicon Graphics Indigo 2 or an Origin 2000 running IRIX Version 6.5 which is compliant.

1.1.1.3 In-House Written Software

- C General

The Coastal Estuarine Circulation Analysis Team (CECAT) within the Products and Services Division of CO-OPS, processes and analyzes current meter data from various sources. The main products generated by the group are (1) Highly quality assured current meter data sets; (2) Harmonic constants used for tidal current predictions at Reference stations and (3) Offset and scaling factors used for current predictions at secondary stations.

- C Testing Strategy

The strategy implemented to test the software used to process and analyze current meter for compliance under the Year 2000 specification was a replication scenario. Normally, the current data processing routine follows a sequential path as shown in the attached flow diagrams (Figure 1). First the data is quality controlled and reformatted into a common format, then various

pieces of software are run on the data set in a defined order that eventually produces the data and prediction products for the Tidal Current Tables and by various users. Within the past year, numerous normal data sets have been satisfactorily processed using the routines described. To test for Year 2000 compliance a few of the previously processed data sets were selected and the time stamps were changed to reflect valid dates from December, 1999 to January, 2001. All the critical midnight crossings were accounted for in these time stamp alterations. The attached table (Table I) shows the critical midnight crossings considered in this analysis and the results of the software that was tested.

The Y2K test and evaluation was made easier by the known limitations and guidelines used in the normal analysis work done by the team. The first limitation was that some software did not consider a year stamp nor do some data sets contain year stamps. Rather, Julian dates are used and leap years are not a problem in these files since the programs are designed to handle leap and nonleap years equally. Secondly, data that spans years in the same data set is not handled by many routines. This is noted in the table by the abbreviation - DSY (Doesn't Span Years). To attempt to test Y2K compliance, at year crossings, two separate data sets (one for December and a second for the following January) were processed separately. First, the December file was processed then the January file. The output from the two runs was then checked and verified that the timing routines handled all dates correctly. Several of the analysis routines that do not span years (lsqha, harm29, harm15, pred, gi, rotary, revred), the output results were such that time stamps were not outputted and what results that would be outputted would not be meaningful. Therefore, tests on these midnight crossings were not conducted.

Another limitation that some of the software is only ran on whole monthly data sets (i.e. the input data is not meant to span months). To test for Y2K compliance during the February/March 2000 midnight crossings, the February data set was run first, followed by the March data set. The times stamps were then verified in both output files.

C **Testing the Processing of Current Meter Data Through 2000**

With this strategy in mind, three potential test data sets were identified and modified to imitate data from the year 2000. These data sets are outlined below.

RDI Narrowband -	Bergen Point PORTS data starting 1 January 1997, ending 30 March 1997
RDI Broadband -	Boliver Roads PORTS data starting 1 July 1997 ending 30 December 1997
Sontek ADP -	Bayonne Bridge PORTS data starting 1 January 1998, ending 30 March 1997

Three separate data sets were required to test the decoding routines since they work on different instruments each with its own format. The decoding routines reformat the data into a standard, instrument nonspecific format with a Julian day time stamp. There after only a single test data set for each critical midnight crossing was maintained for further evaluation.

As indicated in the attached table I, all the test data sets were processed and the results checked for Y2K compliance. In their presently used form, none of the software had problems handling or manipulating time stamps. All software is deemed compliant with Y2K requirements. The following is a list of software that was assessed and a list of specific subroutines and functions where date and time were used.

Program Name: **skhpul.abs**

Subroutines: skrdital (line 166) Compliant
j2date (library) Compliant
date2jd (library) Compliant
date2j (library) Compliant

Program Name: **dsonchk.abs**

Date manipulation in main program.
Program only works on Julian days and is not sophisticated enough to span years.

Program Name: **bbhpul.abs**

Date manipulation in main program.
Subroutines: bbrdital (separate file - bbrdital.f) okay until 2090
j2date (library) Compliant
date2jd (library) Compliant

Program Name: **dbbchk.abs**

Date manipulation in main program.
Program only works on Julian days and is not sophisticated enough to span years.

Program Name: **decoder.abs**

Date manipulation in main program.
Subroutines:delead (line 496)
 conctj (library) Compliant until 2099
Function: xdate (line 1300) Compliant

Program Name: **adcprd.abs**

Date manipulation in main program - Year 2000 compliant.
Subroutine: reed (line 336) - Year 2000 compliant.

Program Name: **dnbchk**

Date manipulation in main program.
Program only works on Julian days and is not sophisticated enough to span years.

Program Name: **datachk**

Date manipulation in main program.
Subroutines:conctj (line 475) Compliant until 2099
 tnext (line 430) Compliant

Program Name: **spread.abs**

Subroutines:sample (line 914)
 conctj (line 1179) Compliant until 2099
 one_depth (line 951) Compliant
 mult_depth (line 1015) Compliant

Program Name: **lsqha**

Date manipulation in main program.
Subroutines:orbit (line 1810) Compliant
 datex (line 887) Compliant
 julian (line 1295) Compliant

Program Name: **harm29**

Note: Contains year 2000 bug as reported and corrected by Chris Zervas.
Subroutines: astro (line 1189) Compliant
 dayxx (line 1365) Compliant
 orbit (line 1316) Compliant
 dblock (line 1328)Compliant

Program Name: **harm15**

Note: Contains year 2000 bug as reported and corrected by Chris Zervas.

Subroutines: astro (line 1104) Compliant
dayxx (line 1280) Compliant
orbit (line 1231) Compliant
dblock (line 1328) Compliant

Program Name: **pred**

Subroutines: conjtc (line 845) Compliant
conctj (line 888) Compliant until 2099
tnext (line 909) Compliant
compin (line 963) Compliant

Program Name: **rotary**

Subroutines: inputt (line 2427) Compliant
conjtc (line 2745) Compliant until 2099

Program Name: **revred**

Subroutines: outr2 (line 535) Compliant
cortm (line 860) Compliant
nextid (line 1133)Compliant
conjtc (line 1857) Compliant until 2099
Function: julian (line 1264) Compliant

Program Name: **gi**

Subroutines: caltime (line 1789) Compliant
conctj (line 2259) Compliant until 2099
conjtc (line 2281) Compliant until 2099
gicalc (line 2316) Compliant

Critical Midnight Crossings

Date Program	12/31/1999 -1/1/2000	2/28/2000 - 2/29/2000	2/29/2000 - 3/1/2000	12/31/2000 - 1/1/2001
adcprd.abs	DSY - Dec - OK, Jan - OK	OK	Feb - OK Mar - OK	DSY - Dec - OK, Jan - OK
decoder.abs	DSY - Dec - OK, Jan - OK	OK	Feb - OK Mar - OK	DSY - Dec - OK, Jan - OK
bbhpul.abs	DSY - Dec - OK, Jan - OK	OK	Feb - OK Mar - OK	DSY - Dec - OK, Jan - OK
dnbchk	DSY - Dec - OK, Jan - OK	OK	Feb - OK Mar - OK	DSY - Dec - OK, Jan - OK
datachk	DSY - Dec - OK, Jan - OK	OK	Feb - OK Mar - OK	DSY - Dec - OK, Jan - OK
dbbchk.abs	DSY - Dec - OK, Jan - OK	OK	Feb - OK Mar - OK	DSY - Dec - OK, Jan - OK
spread.abs	DSY - Dec - OK, Jan - OK	OK	Feb - OK Mar - OK	DSY - Dec - OK, Jan - OK
skhpul.abs	DSY - Dec - OK, Jan - OK	OK	Feb - OK Mar - OK	DSY - Dec - OK, Jan - OK
dsonchk.abs	DSY - Dec - OK, Jan - OK	OK	Feb - OK Mar - OK	DSY - Dec - OK, Jan - OK
lsqha	DSY - Not tested	OK	OK	DSY - Not tested
harm29	DSY - Not tested	OK	OK	DSY - Not tested
harm15	DSY - Not tested	OK	OK	DSY - Not tested
pred	DSY - Dec - OK, Jan - OK	OK	OK	DSY - Dec - OK, Jan - OK
gi	DSY - Dec - OK, Jan - OK	OK	OK	DSY - Dec - OK, Jan - OK
rotary	DSY - Dec - OK, Jan - OK	OK	OK	DSY - Dec - OK, Jan - OK
revred	DSY - Dec - OK, Jan - OK	OK	OK	DSY - Dec - OK, Jan - OK

Table I

C Test Results Briefing

On 20 October 1998 a presentation was given to the the NOS Chief Information Officer (CIO), Hugh Johnson concerning the Y2K compliancy of the Current Data Processing System. The mission of the CECAT team as it relates to the Y2K mission critical software was presented followed by an in depth discussion of the current data processing flow path as outlined in figure 1. The most important Y2K issues in the processing scheme were outlined in the presentation and included the fact that the data from different instruments was reformatted into a generic non-instrument specific julian day type of format. In this type of format 1 January is labeled as day 1 and 31 December is day 365 (or 366 in leap years). This step is deemed the most crucial since it is at this point that the software must recognize the year field and account for the leap year midnight crossing.

Below are two representative , raw sample data records from a SonTek ADP acoustic Doppler Profiler. The date and time fields have been underlined in both records. The time stamp on the first record is 1999 31 December 23:59:00. The time stamp on the second record is 2000 1 January 00:04:59. Following the raw data is the reformatted data output from the skhpul.abs software.

```
16    4125    6804 1999 12 31 23 59 0 3 1 1 2 0
16 100 40 360 2868
998 17 -13 548 9036 2 0 0 1 5 14432
0 0 0 0 78 171 83 177 29 29 30 0 167 237 0 118
1 -642 70 -34 6 5 2 192 183 194
2 -730 88 -33 6 5 2 176 176 176
3 -786 77 -29 6 5 2 174 169 176
4 -816 74 -24 6 6 1 164 158 166
5 -852 82 -19 7 5 1 154 147 156
6 -898 69 -18 7 5 1 144 138 146
7 -928 71 -22 6 5 1 135 129 137
8 -949 72 -20 6 5 1 127 121 128
9 -980 79 -18 6 5 1 119 113 120
10 -1008 89 -22 6 5 1 111 105 113
11 -1030 95 -20 5 4 1 102 96 104
12 -1054 103 -21 5 5 1 93 85 94
13 -943 23 -9 9 10 3 108 102 98
14 -775 -243 -7 18 19 5 126 117 136
15 -946 53 -41 26 28 8 60 55 66
16 -977 66 -43 28 33 9 49 46 52
```



```

16    4125    6805 2000 1 1 0 4 59 3 1 1 2 0
16 100 40 360 2868
998 17 -13 548 9068 2 1 1 1 0 14432
0 0 0 0 78 171 82 177 29 29 30 0 167 237 0 118
1 -595 66 -25 6 5 2 192 184 195
2 -686 72 -25 7 5 2 176 176 177
3 -767 78 -26 7 5 2 176 169 176
4 -811 82 -25 7 5 2 164 158 166
5 -861 79 -24 6 5 2 154 148 156
6 -910 82 -23 5 4 1 144 139 146
7 -939 77 -20 5 4 1 135 130 137
8 -968 79 -21 5 5 1 127 122 129
9 -986 82 -22 5 4 1 119 114 121
10 -1021 90 -28 4 4 1 111 105 113
11 -1024 103 -25 4 4 1 102 95 104
12 -1020 115 -26 5 4 1 91 85 94
13 -956 7 -11 11 9 3 105 102 96
14 -804 -307 -13 20 20 6 131 126 143
15 -910 24 -38 28 26 9 59 55 68
16 -939 54 -41 34 31 10 47 44 50

```

Date (GMT)	XTilt	YTilt	Head	TempC	dBar	Spd	Dir	STd1	STd2	STd3	Amp1	Amp2	Amp3
365.99930	1.7	-1.3	99.8	5.5	14.56	1.85	261	.012	.010	.002	54.6	52.0	55.0
1.00346	1.7	-1.3	99.8	5.5	14.61	1.89	262	.010	.010	.002	54.6	52.5	55.5

In the above reformatted data set the first column contains the calculated Julian date and shows the successful transition from 1999 to the year 2000. All of the instrument specific data is reformatted into the file format shown above and was demonstrated at the briefing that all the conversions were carried out correctly.

1.1.2 Hardware Compliancy

C All Silicon Graphics workstations are running IRIX version 6.5 which is compliant.

C All Silicon Graphics workstation hardware is compliant.

Compliancy documentation on file.